

1                   **SEAT TRACK ASSEMBLY AND METHOD OF MANUFACTURE**  
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4           **Cross Reference to Related Applications**

5                   This invention claims the benefit of U.S. provisional Serial No. 60/443,674, filed  
6           January 29, 2003.

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8           **Field of the Invention**

9                   The present invention relates to seat track assemblies used in positioner  
10           mechanisms for automobile seats.

11  
12           **Background of the Invention**

13                   Automotive powered seat positioning mechanisms are known of the type using a  
14           threaded spindle engaged by a gear nut carried by an upper track, with the gear nut driven by a  
15           worm gearing in turn driven by a motor. Rotation of the gear nut causes the gear nut and an  
16           enclosing gear case to drive the upper track so as to be advanced in either direction along the  
17           spindle. Such mechanisms are described in U.S. Patent 4,802,374 and WO 9951456.

18                   The gear nut and worm gear are typically carried in a gear casing mounted on a U-  
19           shaped bracket having its legs attached to the upper track to cause the movement of the gear nut  
20           to drive the upper track in either direction. The spindle is mounted spaced above the bottom wall  
21           of a lower track on a pair of brackets each located at an opposite end of the spindle, these  
22           brackets in turn attached to the lower track.

23                   The automobile seat is held in any adjusted position by the gear nut and spindle  
24           and these components are thus subjected to high loads in the event of a crash or other high stress

1 event and the support for these components must therefore be designed to have adequate strength  
2 to resist the stresses imposed.

3 It is desirable that the seat adjustment mechanism be fully functional after a crash.

4 The bracket supporting the gear nut and gear casing tends to be distorted as the  
5 upper track supporting the seat and the occupant tends to move forward in a crash or other high  
6 stress event, and this is resisted by the gear nut-spindle engagement, applying of forces offset  
7 from the point of attachment to the upper track. The unattached lower ends of the legs of the  
8 bracket cannot effectively resist these forces. The bottom location of the leg connecting portion  
9 of the bracket prevents any fastener attachment to the side walls of the upper track after assembly  
10 since that portion is then completely inaccessible. Thus, heavy gauge steel must be employed to  
11 construct the bracket to resist the forces applied in this manner.

12 The spindle itself must be well anchored to resist these stresses, which typically is  
13 done by a heavy gauge bracket mounted at each end of the spindle. These sturdy brackets must  
14 in turn be securely attached to the lower track.

15 It is the object of the present invention to provide a track assembly in which the  
16 connection between the bracket and the upper track provides a balanced loading of the bracket  
17 which efficiently resists the forces imposed thereon in a crash or other high stress event.

18 It is another object to simplify the attachment of the spindle to the lower track  
19 while still providing ample strength to withstand the crash induced stresses imposed thereon.  
20

## 21 Summary of the Invention

22 The above object and others which will become apparent upon a reading of the

1 following specification and claims are achieved by a track assembly including nested upper and  
2 lower channel shaped tracks. The upper track and gear case bracket also have portions which are  
3 configured to be interfit together when the upper track is placed over the bracket which creates a  
4 connection therebetween resisting relative displacement therebetween in the lengthwise direction  
5 of the track. The upper track has side walls and a top wall to which an upper end of the bracket  
6 is fixed after the upper track is installed onto the bracket. The interfit portions of the bracket may  
7 comprise a pair of protrusions projecting side ways in opposite directions from a respective side  
8 of bracket leg connecting portion located at the bottom of the bracket. These protrusions may  
9 comprise tabs or teeth which are received in a complementarily shaped notch in a bottom edge of  
10 each upper track sidewall, when the upper track is placed over the bracket during assembly.

11 This design secures both the top and bottom portions of the bracket relative to the  
12 upper track so as to efficiently resist the tendency of the bracket to be deformed under the  
13 stresses developed in a crash event.

14 The spindle itself is anchored at one end by being flattened at one end with an  
15 offset locating the flattened end against the lower track bottom wall so that the spindle is spaced  
16 above the bottom track bottom wall. The flattened end is directly attached to the lower track  
17 bottom wall with fasteners which can also attach the lower track to the floor pan or a separate  
18 mounting bracket.

19 This creates a high strength anchoring of the spindle while eliminating the two  
20 supporting brackets typically employed to mount the spindle. This lowers the manufacturing  
21 costs and precludes any possibility of such support brackets breaking loose in a crash.

1     Description of the Drawings

2             Figure 1 is a pictorial view of an automotive seat supported and positioned by a  
3     pair of parallel track assemblies according to the invention and a drive system therefore.

4             Figure 2 is a pictorial view of one of the track assemblies shown in Figure 1.

5             Figure 3 is a view of a transverse section taken through the track assembly shown  
6     in Figure 2.

7             Figure 4 is an inverted pictorial view of an installed gear casing bracket together  
8     with a fragmentary portion of the upper track to which it is mounted.

9             Figure 5 is an exploded pictorial reverse view of a fragmentary part of the track  
10    assembly shown in Figure 2.

11            Figure 6 is a longitudinal section taken through the track assembly shown in  
12    Figure 2.

13            Figure 7 is an exploded pictorial view of the gear casing and mounting bracket.

14  
15    Detailed Description

16            In the following detailed description, certain specific terminology will be  
17    employed for the sake of clarity and a particular embodiment described in accordance with the  
18    requirements of 35 USC 112, but it is to be understood that the same is not intended to be  
19    limiting and should not be so construed inasmuch as the invention is capable of taking many  
20    forms and variations within the scope of the appended claims.

21            Referring to the drawings, Figure 1 illustrates the mounting of an automotive seat  
22    10 on a pair of parallel track assemblies 12 secured to the vehicle floor pan 14 and to the seat

1 bottom 16 in conventional fashion. A separate mounting bracket (not shown) may also be used  
2 rather than a direct attachment to the floor pan. A rotary drive system 18 is employed to  
3 simultaneously drive an upper track 20 of each track assembly 12 to move the seat forward or  
4 backwards in the well known manner on a lower track 24 comprised of an upward facing channel  
5 within which the upper track 20 is nested.

6 This general arrangement is described in U.S. 4,802,374 and WO 9951456.

7 In this arrangement, each of the upper tracks 20 are driven by rotation of an  
8 associated threaded horizontal spindle 22 mounted to the lower track 24 of each track assembly  
9 12 extending in a lengthwise direction, and a gear nut 26 is threaded onto the spindle 22 (Figure  
10 3). The gear nut 26 is rotatable within a gear casing 28 (Figure 7) and has a lengthwise driving  
11 engagement with the upper track 20 by being captured between the straddling legs 44 of a U-  
12 shaped bracket 30 attached to the upper track 20. The gear case 28 may be made of two die cast  
13 parts assembled together using integral alignment posts as indicated on one part received in  
14 mating holes in the other part as per a common manufacturing practice.

15 A worm gear 34 is also rotatably held in the gear casing 28 rotated by the drive  
16 system 18 by a cable or shaft (not shown) mating with a square drive socket in the ends of the  
17 worm gear. The cable or shaft can pass through an opening 36 (Figure 7) in the side of the gear  
18 casing 28 from the side of each upper track 20. An aligned hole 37 is also provided in each side  
19 wall 54 of the upper track 20 for this same purpose.

20 Each bracket 30 has a pair of mounting flanges 32 each located at the top of a  
21 respective leg 44, and each having a hole 40 receiving a screw 38 passing through an aligned  
22 hole 39 in the upper wall 41 of the upper track 20 to be secured thereto.

1           The parallel legs 44 each extend down from a respective flange 32 (best seen in  
2     Figure 7) and are connected together at their lower ends with a connecting portion 46. The legs  
3     44 have aligned holes 48 to accommodate passage of the spindle 22.

4           The bracket 30 has a pair of protrusions 50 which may be comprised of tab or  
5     tooth features each projecting laterally out in an opposite direction towards a respective upper  
6     track side wall 54 from a respective side edge of the connecting portion 46 of the bracket 30  
7     (Figures 3 and 6).

8           As noted above, the upper track 20 comprises a downwardly facing elongated  
9     channel section nested within the lower track 24 which comprises an upwardly facing elongated  
10    channel section as best seen in Figure 3.

11          The upper track 20 is slidably mounted on the lower track 24 by a bearing  
12    arrangement as described in detail in U.S. Patent 6,557,809 B2, assigned to the assignee of the  
13    present application.

14          This arrangement includes a reversely formed lip 52 extending up from a rolled  
15    bottom edge 74 of each side wall 54 of the upper track 20 (Figure 3). An angled portion 56 of  
16    the lip 52 faces an angled portion 58 of each side wall 60 of the lower track 20 to create a roughly  
17    square bearing space into which are disposed "load transmission elements", here shown as balls  
18    62. An interference is created so that at least one of the tracks is resiliently deflected by the balls  
19    62, as described in detail in U.S. Patent 6,557,809 B2.

20          The rolled bottom edge 74 of each of the upper track side walls 54 are formed  
21    with recesses here shown as notches 64, which are shaped to mate with the protrusions 50  
22    received therein. The notches 64 extend horizontally into the rolled edges 74 at the lower end of

1 each side wall 54. Thus, as the upper track 20 is lowered onto the lower track 24 and over the  
2 bracket 30, the tabs 50 move into the notches 64. This effectively creates an interconnection  
3 resisting lengthwise movement of bracket portion 46 relative the upper track 20 without the need  
4 for installing any fasteners nor any access to the now enclosed bracket 30.

5 This interconnection with the bottom edge of the upper track 20 at the lower end  
6 of the bracket 30 complements the connection of the upper end of the bracket 30 provided by the  
7 later installed fasteners 38 to create a box structure greatly strengthening the ability of the bracket  
8 30 to withstand distorting forces imposed by the nut gear 26 and gear casing 28 in as much as the  
9 legs 44 of the bracket 30 are restrained from bending, and the load is shared with the screws 38.  
10 The bracket 30 can thus be made lighter and is less likely to fail. This connection is achieved  
11 without any additional parts or assembly labor.

12 The spindle 22 is mounted to the lower track 24 by flattening one end 66 of the  
13 spindle 22 (made from alloy steel bar stock).

14 The flattened end 66 is pierced with mounting holes 68 to receive screws 70  
15 passing through holes 72 in the bottom wall of the lower track 24 (as well as a section of the  
16 vehicle floor pan 14 or separate mounting bracket) to secure the one end of the spindle 22  
17 thereto.

18 The spindle 22 is formed with an offsetting transition 76 which positions the  
19 spindle 22 spaced above the bottom wall of the lower track 24, as best seen in Figure 4.

20 This mounting completely eliminates the spindle brackets used in prior designs  
21 which reduces the cost of the track assembly and avoids any possibility of failure by separation of  
22 separate brackets in the event of a crash or other high stress event.

1                   The track assembly is assembled by attaching the spindle to the lower track 24  
2   using screws 70, which at the same time may be attached to the floor pan 14 (or to a separate  
3   mount). The bracket 30, gear nut 26, and gear casing 28 are preassembled to the spindle 22. The  
4   upper track 20 is placed into the lower track 24 with the holes 39 in the top wall 41 aligned with  
5   holes 40 in the bracket flanges 32. The fasteners 38 are then used to fix the bracket flanges 22 to  
6   the top wall 41.

7                   The protrusions 50 and recesses 64 are automatically mated when the upper track  
8   20 is installed on the lower track 24 with the holes 39 and 40 aligned.